Cisco Catalyst 4500 Series Line Cards

Secure, Flexible, Nonstop Communications

Product Benefits

The Cisco® Catalyst® 4500 Series Switches provide scalable nonblocking Layer 2–4 switching with secure, flexible, nonstop communications, enabling business resilience for enterprises, small and medium-sized businesses (SMBs), and Metro Ethernet customers deploying business-critical applications. The Cisco Catalyst 4500 delivers predictable and scalable high performance, with advanced dynamic quality-of-service (QoS) capabilities and configuration flexibility for enterprise wiring closets and SMB access/core. Integrated resiliency features in both hardware and software maximize network availability, helping to ensure workforce productivity, profitability, and customer success. Its centralized, innovative, and flexible system design helps ensure smooth migration to wire-speed IPv6 and 10 Gigabit Ethernet. The flexibility, scalability, and forward and backward compatibility between generations of the Cisco Catalyst 4500 Series extend deployment life, providing exceptional investment protection, reducing the total cost of ownership.

The Cisco Catalyst 4500 E-Series is a high-performance next-generation extension to the Cisco Catalyst 4500 Series. The new “E-Series” is composed of the Cisco Catalyst 4500 Series Supervisor Engine 6-E, E-Series line cards, and E-Series chassis that are designed for secure, flexible, nonstop communications with superior backward and forward compatibility delivering exceptional investment protection for organizations of all sizes.

Cisco Catalyst 4500 E-Series and Classic Line Cards

The Cisco Catalyst 4500 Series offers two classes of line cards: classic and E-Series. Classic line cards provide 6 gigabits of switching capacity per slot. E-Series line cards increase the per slot switching capacity to 24 gigabits. This increase in per slot switching capacity with the E-Series line cards requires the Cisco Catalyst 4500 E-Series chassis and the Cisco Catalyst 4500 Series Supervisor Engine 6-E. Classic line cards may be deployed in both classic and E-Series chassis with either classic Cisco Catalyst 4500 Series supervisor engines or with the Supervisor Engine 6-E. With the Supervisor Engine 6-E, the classic line cards per slot switching capacity remains at 6 gigabits per slot. However, because of the centralized switching architecture of the Cisco Catalyst 4500, the classic line cards will adopt all of the new Supervisor Engine 6-E features such as eight queues per port, dynamic QoS, and hardware-based IPv6 routing. Please refer to the Supervisor Engine 6-E data sheet for more feature details. Classic line cards and E-Series line cards may be mixed and matched within a Cisco Catalyst 4500 E-Series chassis with no performance degradation: classic line cards will operate at 6 gigabits per slot, and E-Series line cards will operate at 24 gigabits per slot. Table 1 summarizes the chassis and supervisor support for both classic and E-Series line cards.

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Table 1. Cisco Catalyst 4500 Line-Card Support Options

Line-Card Type	Per Slot Bandwidth	Chassis Support	Supervisor Support
Cisco Catalyst 4500 E-Series Line Cards	24 Gbps	Cisco Catalyst 4503-E, 4506-E, 4507R-E, and 4510R-E	Supervisor Engine 6-E, Supervisor Engine 6L-E,
Cisco Catalyst 4500 Series Classic Line Cards	6 Gbps	Cisco Catalyst 4503, 4506, 4507R, and 4510R[1] Switches Cisco Catalyst 4503-E, 4506-E, 4507R-E, and 4510R-E Switches	Supervisor Engine 6-E, Supervisor Engine 6L-E, Supervisor Engine V-10GE, Supervisor Engine V, Supervisor Engine IV, Supervisor II-Plus-10GE, Supervisor Engine II-Plus, Supervisor Engine II-Plus-TS[2]

Cisco Catalyst 4500 E-Series Gigabit Ethernet Line Cards

The Cisco Catalyst 4500 E-Series 48-port Gigabit Ethernet line cards provide high-performance 10/100/1000 switching at 24 Gbps per slot. (2:1 oversubscribed). The Cisco Catalyst 4500 48-port 10/100/1000 E-Series line cards are designed for LAN access applications where desktop users require gigabit connection speeds. The Cisco Catalyst 4500 48-port 10/100/1000 E-Series line cards are available in two versions: one with standard PoE 802.3af, and the second one with standard PoE 802.3af and PoEP ready features such as support for up to 30 Watts per port.

Cisco Catalyst 4500 E-Series 10 Gigabit Ethernet Line Card

The Cisco Catalyst 4500 E-Series now supports 10 Gigabit Ethernet line cards. The Cisco Catalyst 4500 6-port E-Series 10 Gigabit Ethernet line card (2.5:1 oversubscribed) can be deployed for high-performance 10 Gigabit Ethernet aggregation in the campus, in small to medium networks as a core switch, or for high-performance wiring closets where additional 10 Gigabit Ethernet uplinks are required. The Cisco Catalyst 4500 E-Series 6-port 10 Gigabit Ethernet line card supports standard X2 optics as well as the Cisco TwinGig modules. The Cisco Catalyst 4500 48-port 10/100/1000 E-Series linecards are available in two versions: one with data-only capabilities, and the second one with standard PoE 802.3af and PoEP ready features such as support for up to 30 Watts per port.

The Cisco TwinGig Converter Module converts a single 10 Gigabit Ethernet X2 interface into two Gigabit Ethernet port slots, which can be populated with appropriate Small Form-Factor Pluggable (SFP) optics, providing a total of 12 wire-speed Gigabit Ethernet ports if used in all 6 X2 interface slots. The flexibility provided by the TwinGig Converter Module enables customers to aggregate Gigabit Ethernet and 10 Gigabit Ethernet LAN access switches on a single line card. The ability to support either Gigabit Ethernet uplinks or 10 Gigabit Ethernet ports on a single line card further demonstrates the flexibility and the investment protection of the Cisco Catalyst 4500 Series architecture (Figure 1).

TwinGig modules convert a single X2 port into two Gigabit Ethernet SFP ports.

[1] Supervisor Engine 6-E, Supervisor Engine V-10GE and Supervisor Engine V are the only supervisors supported on 4510R-E and 4510-R Chassis
[2] Supervisor Engine II-Plus-TS is supported on 4503-E and 4503 Chassis only

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Figure 1. TwinGig Module

Cisco Catalyst 4500 E-Series and Classic Power over Ethernet Line Cards

The Cisco Catalyst 4500 Series offers line cards, power supplies, and accessories required to deploy and operate a standards-based PoE internetwork. PoE provides –48 VDC power over standard Category 5 unshielded twisted-pair (UTP) cable up to 100 meters when an IEEE 802.3af-compliant or Cisco prestandard powered device is attached to the PoE line-card port. Instead of requiring wall power, attached devices such as IP phones, wireless base stations, video cameras, and other IEEE-compliant appliances can use power provided from the Cisco Catalyst 4500 Series PoE line cards. This capability gives network administrators centralized control over power and eliminates the need to install outlets in ceilings and other out-of-the-way places where a powered device can be installed.

Although all references to “PoE,” “inline power,” and “voice” power supplies and line cards are synonymous, there are currently only two versions: Cisco prestandard and IEEE 802.3af compliant. Every Cisco Catalyst 4500 Series chassis and PoE power supply supports the IEEE 802.3af standard and the Cisco prestandard power implementation, helping ensure backward compatibility with existing devices powered by Cisco. All IEEE 802.3af-compliant line cards can distinguish an IEEE or Cisco prestandard powered device from an unpowered network interface card (NIC), helping ensure power is applied only when an appropriate device is connected.

Cisco Catalyst 4500 Classic Fast Ethernet and Gigabit Line Cards

The Cisco Catalyst 4500 Series offers a variety of classic Fast Ethernet and Gigabit Ethernet line cards that include fiber and copper interfaces optimized for desktops, branch office backbones, and servers for enterprise and commercial switching solutions, and service provider metropolitan Ethernet networks. Gigabit Ethernet line cards include cost-effective, high-performance 1000BASE-X gigabit interface converter (GBIC) and SFP-based Gigabit Ethernet line cards and the high-density 10/100/1000BASE-T triple-speed autosensing, autonegotiating Gigabit Ethernet line cards. Fast Ethernet line cards include various densities of wire-speed 10/100, 100-FX, 100BASE-LX10, and 100BASE-BX-D options.

Features and Benefits

Functionally Transparent

Cisco Catalyst 4500 Series switches offers an extensive line of modules that support numerous speeds and physical media combinations. These line cards are functionally transparent; all the packet processing, queuing, buffering, and QoS occur in the supervisor engine. To that end, both classic and E-Series line cards acquire the features and capabilities of the installed supervisor engine. For example, a classic line card previously deployed with a classic supervisor engine using 4 queues per port will automatically have capability for 8 queues per port (first half CY2008) if redeployed with a Supervisor Engine 6-E. This architecture enables customers to easily upgrade

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all Ethernet line cards on their Cisco Catalyst 4500 Series systems to higher-layer switching functions by adding a new supervisor engine. The simple design of the line cards results in a very high mean time between failures (MTBF), helping ensure high availability for a single connection to an end user.

Modular Versatility

The Cisco Catalyst 4500 Series is a centralized architecture that is designed to provide dedicated wire-speed bandwidth to each line-card slot within the chassis. Each line card has a dedicated bandwidth to the supervisor engine for packet processing. All network data that flows into the Cisco Catalyst 4500 Series through the various line cards goes through the supervisor engine for processing, even in single-slot port-to-port communications. All line cards have some per slot bandwidth that allows network administrators to design a system that offers full dedicated bandwidth-to-server and switch-to-switch applications and still provide high performance over subscribed gigabit to the desktop.

A modular centralized design allows customers to use their investment in high-performance line cards across the entire line of Cisco Catalyst 4500 Series chassis and supervisor engines. For example, line cards that shipped with the original Cisco Catalyst 4003 Switch in 1999 will work in the Cisco Catalyst 4500 E-Series chassis. Because of the centralized architecture of the Cisco Catalyst 4500, all line cards deployed in a chassis benefit from the enhanced features the supervisor engine provides including Security, QoS, Layer 2/3/4 routing, and hardware-based IPv6.

Following are descriptions of line cards that are available for Cisco Catalyst 4500 Series switches.

Cisco Catalyst 4500 E Series Fiber Line Card

Figure 2 shows the WS-X4624-SFP-E.

Figure 2. WS-X4624-SFP-E

WS-X4624-SFP-E:

- 24 port Line Rate SFP line card providing 24 gigabits per slot capacity
- 24 ports
- Supports pluggables; GLC-BX-D, GLC-BX-U, GLC-SX-MM, GLC-LH-SM, GLC-ZX-SM, GLC-T, CWDM and DWDM
- Cisco IOS® Software Release 12.2(44)SG or later
- L2-4 Jumbo Frame support (up to 9216 bytes)
- Inherits Supervisor Engine 6-E QoS capability
- Compatible ONLY with Supervisor Engine 6-E

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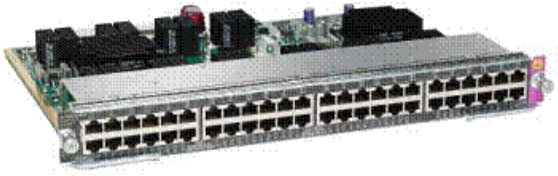
- Compatible with Classic Catalyst 4500 line cards in the E-Series chassis with no performance degradation
- Mid-market and Commercial Core and Distribution deployments requiring line rate capability

Cisco Catalyst 4500 E Series 10/100/1000 Line Cards

Figure 3 shows the WS-X4648-RJ45-E.

Figure 3. WS-X4648-RJ45-E Cisco Catalyst 4500 E-Series 48-Port Data-only 10/100/1000 (RJ-45)



WS-X4648-RJ45-E:

- 24 gigabits per slot capacity
- 48 ports
- 10/100/1000 module (RJ-45)
- Cisco IOS Software Release 12.2(50)SG or later
- Bandwidth is allocated across eight 6-port groups, providing 3 Gbps per port group (2:1)
- L2-4 Jumbo Frame support (up to 9216 bytes)
- Enterprise Campus, Commercial collapsed core and Branch applications requiring enhanced performance for large file transfers and network backups

Figure 4 shows the WS-X4648-RJ45V+E.

Figure 4. WS-X4648-RJ45V+E Cisco Catalyst 4500 E-Series 48-Port 802.3af PoE and PoEP-ready 10/100/1000 (RJ-45)

WS-X4648-RJ45V+E:

- 24 gigabits per slot capacity
- 48 ports
- 10/100/1000 module (RJ-45)
- Cisco IOS Software Release 12.2(40)SG or later
- IEEE 802.3af and Cisco prestandard PoE, IEEE 802.3x flow control
- Bandwidth is allocated across eight 6-port groups, providing 3 Gbps per port group (2:1)
- L2-4 Jumbo Frame support (up to 9216 bytes)
- Capable of up to 30W of inline power per port

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- Enterprise and commercial: designed to power next generation IP phones, wireless base stations, video cameras, and other PoE devices
- Campus and Branch applications requiring enhanced performance for large file transfers and network backups

Figure 5 shows the WS-X4648-RJ45V-E.

Figure 5. WS-X4648-RJ45V-E Cisco Catalyst 4500 E-Series 48-Port 802.3af PoE 10/100/1000 (RJ-45)

WS-X4648-RJ45V-E:

- 24 gigabits per slot capacity
- 48 ports
- 10/100/1000 module (RJ-45)
- Cisco IOS Software Release 12.2(40)SG or later
- Bandwidth is allocated across eight 6-port groups, providing 3 Gbps per port group (2:1)
- L2-4 Jumbo Frame support (up to 9216 bytes)
- IEEE 802.3af and Cisco prestandard PoE, IEEE 802.3x flow control
- Enterprise and commercial: designed to power IP phones, wireless base stations, video cameras, and other IEEE-compliant powered devices
- Campus and Branch applications requiring enhanced performance for large file transfers and network backups

Cisco Catalyst 4500 E Series 10 Gigabit Line Card

Figure 6 shows the WS-X4606-X2-E.

Figure 6. WS-X4606-X2-E Cisco Catalyst 4500 E-Series 6-Port 10 Gigabit Ethernet (X2)

WS-X4606-X2-E:

- 24 gigabits per slot capacity
- Up to 6 ports 10GE X2 or 12 ports 1GE SFP via TwinGig Converter Module
- TwinGig modules must be used in groups of three: ports 1-3 or ports 4-6
- 10GBASE-X (X2) and 1GBASE-X (SFP)
- Cisco IOS Software Release 12.2(40)SG or later
- IEEE 802.3
- 24-gigabit bandwidth is allocated across six 10 Gigabit Ethernet ports (2.5:1)

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- L2-4 Jumbo Frame support (up to 9216 bytes)
- Enterprise and commercial: designed for high-speed backbone, switch-to-switch applications, or small server farms

Cisco Catalyst 4500 Classic Line Cards

Classic Gigabit Ethernet over Copper with Power over Ethernet

Figure 7 shows the WS-X4548-RJ45V+

Figure 7. WS-X4548-RJ45V+ Cisco Catalyst 4500 48-Port 802.3af PoE and PoEP-ready 10/100/1000 (RJ-45)

WS-X4548-RJ45V+:

- 48 ports
- 10/100/1000 (RJ-45)
- Cisco IOS Software Release 12.2(50)SG or later
- IEEE 802.3af and Cisco prestandard PoE, IEEE 802.3x flow control
- Bandwidth is allocated across six 8-port groups, providing 1 Gbps per port group
- Capable of up to 30W of inline power per port
- Enterprise and commercial: designed to power next generation IP phones, wireless base stations, video cameras, and other PoE devices that require power up to 30 Watts

Figure 8 shows the WS-X4548-GB-RJ45V.

Figure 8. WS-X4548-GB-RJ45V Cisco Catalyst 4500 PoE IEEE 802.3af 10/100/1000, 48 Ports (RJ-45)

WS-X4548-GB-RJ45V:

- 48 ports
- 10/100/1000 (RJ-45)
- Cisco IOS Software Release 12.2(18)EW or later
- IEEE 802.3af and Cisco prestandard PoE, IEEE 802.3x flow control
- Bandwidth is allocated across six 8-port groups, providing 1 Gbps per port group

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- Enterprise and commercial: designed to power IP phones, wireless base stations, video cameras, and other IEEE-compliant powered devices

Figure 9 shows the WS-X4524-GB-RJ45V.

Figure 9. WS-X4524-GB-RJ45V Cisco Catalyst 4500 PoE IEEE 802.3af 10/100/1000, 24 Port (RJ-45)

WS-X4524-GB-RJ45V:

- 24 ports
- 10/100/1000 (RJ-45)
- Cisco IOS Software Release 12.2(20)EW or later
- IEEE 802.3af and Cisco prestandard PoE, IEEE 802.3x flow control
- Bandwidth is allocated across six 4-port groups, providing 1 Gbps per port group
- Enterprise and commercial: designed to power IP phones, wireless base stations, video cameras, and other IEEE-compliant powered devices

Classic Gigabit Ethernet over Copper

The Cisco Catalyst 4500 Series offers a variety of gigabit-over-copper solutions for wiring closets and server farms, enabling high-density gigabit connectivity to the desktop and servers over Category 5 copper cabling. The line-card options for the Cisco Catalyst 4500 Series (Table 2) include a 24- and 48-port 10/100/1000BASE-T module in both PoE and non-PoE versions. These modules provide wiring closet investment protection by allowing Fast Ethernet desktops to migrate to Gigabit Ethernet in the future without replacement of the switch line cards.

Figure 10 shows the WS-X4548-GB-RJ45.

Figure 10. WS-X4548-GB-RJ45 Cisco Catalyst 4500 Enhanced 48-Port 10/100/1000 Module (RJ-45)

WS-X4548-GB-RJ45:

- 48 ports
- 10/100/1000 module (RJ-45)
- Cisco IOS Software Release 12.1(19)EW or later
- IEEE 802.3x flow control
- Bandwidth is allocated across six 8-port groups, providing 1 Gbps per port group

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- More power efficient and more cost effective than the WS-X4448-GB-RJ45
- Enterprise and commercial: designed for gigabit to the desktop

Figure 11 shows the WS-X4448-GB-RJ45.

Figure 11. WS-X4448-GB-RJ45 Cisco Catalyst 4500 48-Port 10/100/1000 Module (RJ-45)

WS-X4448-GB-RJ45:

- 48 ports
- 10/100/1000 module (RJ-45)
- Cisco IOS Software Release 12.1(8a)EW or later
- IEEE 802.3x flow control
- Bandwidth is allocated across six 8-port groups, providing 1 Gbps per port group
- Enterprise and commercial: designed for gigabit-to-the-desktop applications

Figure 12 shows the WS-X4424-GB-RJ45.

Figure 12. WS-X4424-GB-RJ45 Cisco Catalyst 4500 24-Port 10/100/1000 Module (RJ-45)

WS-X4424-GB-RJ45:

- 24 ports
- 10/100/1000 module (RJ-45)
- Cisco IOS Software Release 12.1(8a)EW or later
- IEEE 802.3x flow control
- Bandwidth is allocated across six 4-port groups, providing 1 Gbps per port group
- Enterprise and commercial: designed for gigabit-to-the-desktop and server-farm applications

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Classic Gigabit Ethernet (GBIC or SFP)

The Cisco Catalyst 4500 Series offers a variety of GBIC- or SFP-enabled gigabit solutions for high-performance Gigabit Ethernet uplinks and server farm connectivity. The five GBIC- or SFP-enabled gigabit line-card options for the Cisco Catalyst 4500 Series include 2-, 6-, 18-, and 48-port versions. GBIC or SFP technology allows customers to intermix intrabuilding MMF connections and long-distance single-mode connections simply by changing the GBIC or SFP type. (See Table 3 for more information.)

Figure 13 shows the WS-X4302-GB.

Figure 13. WS-X4302-GB Cisco Catalyst 4500 Gigabit Ethernet Module, 2 Ports (GBIC)

WS-X4302-GB:

- 2 ports
- 1000BASE-X GBIC
- Cisco IOS Software Release 12.1(19)EW or later
- IEEE 802.3 standard Ethernet over fiber
- L2-4 Jumbo Frame support (up to 9216 bytes)
- Enterprise and commercial: designed for uplinks, server farms, and switch-to-switch applications
- Metro Ethernet: GBIC flexibility designed for network operators building the next generation of Metro Ethernet networks

Figure 14 shows the WS-X4306-GB.

Figure 14. WS-X4306-GB Cisco Catalyst 4500 Gigabit Ethernet Module, 6 Ports (GBIC)

WS-X4306-GB:

- 6 ports
- 1000BASE-X (GBIC)
- Cisco IOS Software Release 12.1(8a)EW or later
- IEEE 802.3

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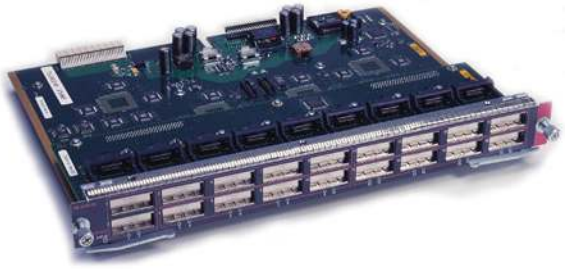
- L2-4 Jumbo Frame support (up to 9216 bytes)
- Enterprise and commercial: designed for high-speed backbone, switch-to-switch applications, or small server farms
- Metro Ethernet: GBIC flexibility, six ports of dedicated 1000BASE-X Gigabit Ethernet uplinks

Figure 15 shows the WS-X4418-GB.

Figure 15. WS-X4418-GB Cisco Catalyst 4500 Gigabit Ethernet Module, Server Switching 18 Ports (GBIC)



WS-X4418-GB:

- 18 ports
- 1000BASE-X (GBIC)
- Cisco IOS Software Release 12.1(8a)EW or later
- IEEE 802.3, IEEE 802.3x flow control
- 2 ports of wire-speed 1000BASE-X Gigabit Ethernet uplinks
- 16 ports: 4:1 oversubscribed
- Enterprise and commercial: designed for fiber to the desktop, switch-to-switch applications, or small server farms
- Metro Ethernet: GBIC flexibility designed for network operators building the next generation of Metro Ethernet networks

Figure 16 shows the WS-X4448-GB-SFP.

Figure 16. WS-X4448-GB-SFP Cisco Catalyst 4500 Gigabit Ethernet Module, 48 Ports 1000X (SFP)

WS-X4448-GB-SFP:

- 48 ports
- 1000BASE-X (SFP)
- Cisco IOS Software Release 12.2(20)EW or later

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- IEEE 802.3x flow control
- Bandwidth is allocated across six 8-port groups, providing 1 Gbps per port group
- Enterprise and commercial: designed for server farms and switch-to-switch applications
- Metro Ethernet: designed for service providers to run point-to-point Gigabit Ethernet over single-mode fiber

Figure 17 shows the WS-X4506-GB-T.

Figure 17. WS-X4506-GB-T Cisco Catalyst 4500 6-Port 10/100/1000 RJ-45 PoE IEEE 802.3af and 1000BASE-X (SFP)

WS-X4506-GB-T:

- 6-port 10/100/1000 and 6-port SFP (any combination of up to 6 ports can be active at one time)
- 10/100/1000 RJ-45 PoE and 1000BASE-X (SFP)
- Cisco IOS Software Release 12.2(20)EWA
- PoE IEEE 802.3af and Cisco prestandard (RJ-45 only)
- Provides full line-rate gigabit switching on all ports
- L2-4 Jumbo Frame support (up to 9216 bytes)
- Designed to give customers the choice of RJ-45 with or without PoE and SFP without incurring extra costs
- Enterprise and commercial: high-performance desktop connectivity and server farms; designed to power IP phones, wireless base stations, video cameras, and other IEEE-compliant appliances
- Metro Ethernet: designed for service providers to run point-to-point Gigabit Ethernet over single-mode fiber

Classic Fast Ethernet Power over Ethernet

Figure 18 shows the WS-X4224-RJ45V.

Figure 18. WS-X4224-RJ45V Cisco Catalyst 4500 PoE IEEE 802.3af 10/100, 24 Ports (RJ-45)

WS-X4224-RJ45V:

- 24 ports

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- 10/100 (RJ-45)
- Cisco IOS Software Release 12.2(20)EW or later
- IEEE 802.3af PoE and Cisco prestandard PoE
- Enterprise and commercial: designed to power IP phones, wireless base stations, video cameras, and other IEEE-compliant powered devices

Figure 19 shows the WS-X4248-RJ45V.

Figure 19. WS-X4248-RJ45V Cisco Catalyst 4500 PoE IEEE 802.3af 10/100, 48 Ports (RJ-45)

WS-X4248-RJ45V:

- 48 ports
- 10/100 (RJ-45)
- Cisco IOS Software Release 12.2(18)EW or later
- IEEE 802.3af PoE and Cisco prestandard
- Enterprise and commercial: designed to power IP phones, wireless base stations, video cameras, and other IEEE-compliant powered devices

Figure 20 shows the WS-X4248-RJ21V.

Figure 20. WS-X4248-RJ21V Cisco Catalyst 4500 PoE IEEE 802.3af 10/100, 48 Ports (RJ-21)

WS-X4248-RJ21V:

- 48 ports
- 10/100 (RJ-21)
- Cisco IOS Software Release 12.2(18)EW or later
- IEEE 802.3af PoE and Cisco prestandard
- Enterprise and commercial: designed to power IP phones, wireless base stations, video cameras, and other IEEE-compliant powered devices with improved cable management RJ-21 connectors

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Classic Fast Ethernet over Copper

Figure 21 shows the WS-X4124-RJ45.

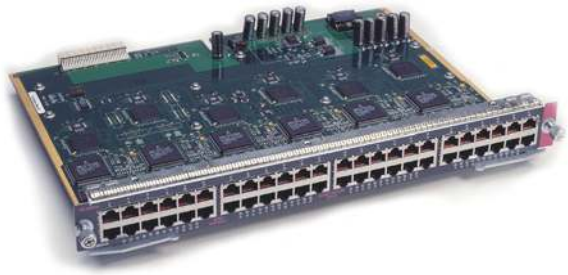
Figure 21. WS-X4124-RJ45 Cisco Catalyst 4500 10/100 Module, 24 Ports (RJ-45)

WS-X4124-RJ45:

- 24 ports
- 10/100BASE-T module (RJ-45)
- Cisco IOS Software Release 12.2(20)EW or later
- IEEE 802.3
- Enterprise and commercial: designed for desktop connectivity and wiring closets

Figure 22 shows the WS-X4148-RJ.

Figure 22. WS-X4148-RJ Cisco Catalyst 4500 10/100 Module, 48 Ports (RJ-45)



WS-X4148-RJ:

- 48 ports
- 10/100BASE-T module (RJ-45)
- Cisco IOS Software Release 12.1(8a)EW or later
- IEEE 802.3
- Enterprise and commercial: high-port-density solution for desktop connectivity

Figure 23 shows the WS-X4148-RJ21.

Figure 23. WS-X4148-RJ21 Cisco Catalyst 4500 10/100 Module, 48 Ports Telco (4 x RJ-21)

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WS-X4148-RJ21:

- 48 ports
- Telco 10/100BASE-T module (4 x RJ-21)
- Cisco IOS Software Release 12.1(8a)EW or later
- IEEE 802.3
- Enterprise and commercial: high-port-density solution with improved cable management RJ-21 connectors for desktop connectivity

Classic Fast Ethernet over Fiber

Figure 24 shows the WS-X4248-FE-SFP.

Figure 24. WS-X4248-FE-SFP Cisco Catalyst 4500 Fast Ethernet Switching Module, 48-Port 100BASE-X (SFP)

WS-X4248-FE-SFP:

- 48-port 100BASE-X (SFP optional)
- Customers can mix and match 100BASE-X SFP optics on the same line card.
- An alternative to the Cisco Catalyst 4500 fixed 100BASE-X line cards (WS-X4148-FX-MT, WS-X4124-FX-MT, WS-X4148-FE-LX-MT and WS-X4148-FE-BD-LC).
- SFP optics supported in Cisco IOS Software Release 12.2(25)SG include 100BASE-FX, 100BASE-LX10, 100BASE-BX-D, and 100BASE-BX-U.
- IEEE 802.3, IEEE 802.3ah, IEEE 802.3x flow control
- Enterprise and commercial: fiber-to-the-desktop applications
- Metro Ethernet: For service providers running point-to-point Fast Ethernet to the home or business

Figure 25 shows the WS-X4124-FX-MT.

Figure 25. WS-X4124-FX-MT Cisco Catalyst 4500 Fast Ethernet Switching Module, 24-Port 100BASE-FX (MT-RJ)

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WS-X4124-FX-MT:

- 24 ports
- 100BASE-FX multimode fiber (MMF) (MT-RJ)
- Cisco IOS Software Release 12.1(8a)EW or later
- IEEE 802.3
- Enterprise and commercial: affordable connection for fiber-to-the-desktop applications. Optimized for government or for anyone requiring the security and resiliency of fiber to the desktop.
- Metro Ethernet: residential customers located within a 1.2-mile (2-km) radius

Figure 26 shows the WS-X4148-FX-MT.

Figure 26. WS-X4148-FX-MT Cisco Catalyst 4500 Fast Ethernet Switching Module, 48-Port 100BASE-FX (MMF)

WS-X4148-FX-MT:

- 48 ports
- 100BASE-FX MMF (MT-RJ)
- Cisco IOS Software Release 12.1(8a)EW or later
- IEEE 802.3
- Enterprise and commercial: affordable high-density connection for fiber-to-the-desktop applications. Optimized for government or for anyone requiring the security and resiliency of fiber to the desktop.
- Metro Ethernet: residential customers located within a 1.2-mile (2-km) radius

Figure 27 shows the WS-X4148-FE-BD-L.

Figure 27. WS-X4148-FE-BD-LC Cisco Catalyst 4500 Series 48-Port 100BASE-BX10-D Fast Ethernet Line Card for Single Strand of SMF

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WS-X4148-FE-BD-LC:

- 48 ports
- 100BASE-BX10-D for single strand of single-mode fiber
- Cisco IOS Software Release 12.2(18)EW or later
- IEEE 802.3ah, IEEE 802.3
- Bidirectional Fast Ethernet operates over a single strand of fiber
- Metro Ethernet: designed for network operators building the next-generation Metro Ethernet network over distances up to 6.2 miles (10 km)

Specification Summary

Tables 2 through 8 summarize product specifications.

Table 2. Port Information for Line Cards

Line Card	Number of Ports	Port Speed	Port Type	Wire Rate	Cisco Catalyst 4500 Series Min/Max Ports		
					4503-E	4506-E/ 4507R-E	4510R-E
E-Series Line Cards							
WS-X4648-RJ45V+E	48	10/100/1000	RJ-45	2-to-1	48/96*	48/240*	48/240*
WS-X4648-RJ45V-E	48	10/100/1000	RJ-45	2-to-1	48/96*	48/240*	48/240*
WS-X4648-RJ45-E	48	10/100/1000	RJ-45	2-to-1	48/96*	48/240*	48/240*
WS-X4624-SFP-E	24	1000	Pluggables	1:1	24/48	24/120	24/168
WS-X4606-X2-E	6	10GBASE-X	X2 or SFP with TwinGig Converter Module	2.5-to-1 with X2 1:1 with SFP	6/14* 12/26*	6/34* 12/68*	6/34* 12/68*
Classic Gigabit over Copper PoE Line Cards							
WS-X4548-RJ45V+	48	10/100/1000	RJ-45 PoE IEEE 802.3af, Cisco prestandard and PoEP-ready	8-to-1**	48/96	48/240	48/384
WS-X4548-GB-RJ45V	48	10/100/1000	RJ-45 PoE IEEE 802.3af and Cisco prestandard	8-to-1**	48/96	48/240	48/384
WS-X4524-GB-RJ45V	24	10/100/1000	RJ-45 PoE IEEE 802.3af and Cisco prestandard	4-to-1**	24/48	24/120	24/168
Classic Gigabit Ethernet (Copper) Line Cards							
WS-X4548-GB-RJ45	48	10/100/1000	RJ-45	8-to-1**	48/96	48/240	48/384
WS-X4448-GB-RJ45	48	10/100/1000	RJ-45	8-to-1**	48/96	48/240	48/384

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Line Card	Number of Ports	Port Speed	Port Type	Wire Rate	Cisco Catalyst 4500 Series Min/Max Ports		
					4503-E	4506-E/ 4507R-E	4510R-E
WS-X4424-GB-RJ45	24	10/100/1000	RJ-45	4-to-1**	24/48	24/120	24/168
Classic Gigabit Ethernet (GBIC or SFP) Line Cards							
WS-X4302-GB	2	1000BASE-X IEEE 802.3	GBIC	Yes	2/4	2/10	2/16
WS-X4306-GB	6	1000BASE-X	GBIC	Yes	6/12	6/30	6/42
WS-X4418-GB	18	1000BASE-X	GBIC	2 ports full 16 ports 4-to-1**	18/36	18/90	18/126
WS-X4448-GB-LX	48	1000BASE-LX	48 SFPs (included)	8-to-1**	48/96	48/240	48/384
WS-X4448-GB-SFP	48	1000BASE-X	SFP	8-to-1**	48/96	48/240	48/384
WS-X4506-GB-T	6 + 6	10/100/1000	1000BASE-X (SFP) RJ-45 PoE IEEE 802.3af and Cisco prestandard	Yes	6/12	6/30	6/42
Classic Fast Ethernet over Fiber Line Cards							
WS-X4248-FE-SFP	48	100BASE-X	SFP	Yes	48/96	48/240	48/384
WS-X4124-FX-MT	24	100BASE-FX (MT-RJ)	–	Yes	24/48	24/120	24/168
WS-X4148-FX-MT	48	100BASE-FX	MMF MT-RJ	Yes	48/96	48/240	48/384
WS-X4148-FE-BD-LC	48	100BASE-BX10-D	SMF Single LC	Yes	48/96	48/240	48/384
Classic Fast Ethernet over Copper Line Cards							
WS-X4124-RJ45	24	10/100	RJ-45	Yes	24/48	24/120	24/168
WS-X4148-RJ	48	10/100	RJ-45	Yes	48/96	48/240	48/384
WS-X4148-RJ21	48	10/100	RJ-21	Yes	48/96	48/240	48/384
Classic Fast Ethernet PoE Line Cards							
WS-X4224-RJ45V	24	10/100	RJ-45 PoE IEEE 802.3af and Cisco prestandard	Yes	24/48	24/120	24/168
WS-X4248-RJ45V	48	10/100	RJ-45 PoE IEEE 802.3af and Cisco prestandard	Yes	48/96	48/240	48/384
WS-X4248-RJ21V	48	10/100	RJ-45 PoE IEEE 802.3af and Cisco prestandard	Yes	48/96	48/240	48/384

* E-Series line cards require E-Series chassis.
** The amount of oversubscription can be controlled by varying the number of ports used at 1000 Mbps. All ports can use Gigabit EtherChannel® or IEEE 802.3ad for high-speed interconnection applications. All oversubscribed ports use the standard IEEE 802.1x flow control (PAUSE frame) mechanism to control Gigabit Ethernet host traffic.

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Table 3. X2 Options

Interface Type	Name	Max Distance	Cable Type	Part Number
10GBASE-LR	10GBASE-LR X2 transceiver module for SMF, 1310-nm wavelength, SC duplex connector	10km	SMF	X2: X2-10GB-LR
10GBASE-SR	10GBASE-SR X2 transceiver module for MMF, 850-nm wavelength, SC duplex connector	33m	MMF	X2: X2-10GB-SR
10GBASE-CX4	10GBASE-CX4 X2 transceiver module for CX4 cable, copper, InfiniBand 4X connector	15m	Copper InfiniBand	X2: X2-10GB-CX4
10GBASE-ER	10GBASE-ER X2 transceiver module for SMF, 1550-nm wavelength, SC duplex connector	40km	SMF	X2: X2-10GB-ER
10GBASE-LX4	10GBASE-LX4 X2 transceiver module for MMF, 1310-nm wavelength, SC duplex connector	300m	MMF	X2: X2-10GB-LX4
10GBASE-LRM	10GBASE-LX4 X2 transceiver module for MMF, 1310-nm wavelength, SC duplex connector	220m	MMF	X2-10GB-LRM
10GBASE-ZR	10GBASE-ZR X2 transceiver module for SMF, 1550 nm wavelength. DOM is not supported.	80km	SMF	X2-10GB-ZR
10GBASE-DWDM	10GBASE-ZR X2 transceiver module for SMF, 32 nontunable ITU 100-GHz wavelengths. DOM is supported. Dual SC/PC connectors are supported.	80km	SMF	X2-10GB-DWDM
X2 to SFP converter	TwinGig Converter Module			CVR-X2-SFP
X2 to SFP converter (10G)	10G X2 to SFP+ Converter			CVR-X2-SFP10G

Table 4. GBIC, SFP Options

Interface Type	Name	Max Distance	Cable Type	Part Number
1000BASE-T	Category 5 twisted pair	100m	Category 5	• SFP: GLC-T • GBIC: WS-G5483
1000BASE-SX	Short wavelength	550m	MMF	• SFP: GLC-SX-MM • GBIC: WS-G5484
1000BASE-LX	Long wavelength/long haul	10 km on SMF 5 km on MMF	SMF	• SFP: GLC-LH-SM • GBIC: WS-G5486
1000BASE-ZX	Extended distance	70 km to 100 km	SMF	• SFP: GLC-ZX-SM • GBIC: WS-G5487
CWDM	Coarse wavelength-division multiplexing	100 km	SMF	• SFP: CWDM-SFP-XXXX • GBIC: CWDM-GBIC-XXXX
DWDM	Dense wavelength-division multiplexing	–	–	GBIC only

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Table 5. Fast Ethernet Optical Transmission Characteristics

Port Type	BER	Nominal Wavelength (NM)	Launch Power	
			Max (dBm)	Min (dBm)
100BASE-FX	2.5 x 10e-(10)	1270–1380	–14	–20
100BASE-LX10*	1 x 10e-(12)	1260–1360	–8	–15
100BASE-BX10-D3**	1 x 10e-(12)	1480–1580	–8	–14

* Draft 1.3.
** Draft 2.0.

Table 6. Fast Ethernet Optical Reception Characteristics

Port Type	BER	Nominal Wavelength (NM)	Receive Sensitivity	
			Max (dBm)	Min (dBm)
100BASE-FX	2.5 x 10e-(10)	1270–1380	–14	–31
100BASE-LX10[Error! Bookmark not defined.]	1 x 10e-(12)	1260–1360	–8	–25
100BASE-BX10-D	1 x 10e-(12)	1260–1360	–8	–28.2

Table 7. Gigabit Ethernet Port Cabling Specifications

Port Type	Wavelength (Nanometer)	Fiber Type	Core Size (Micron)	Modal Bandwidth (MHz/km)	Cable Distance
Cisco 1000BASE-SX	850	MMF	• 62.5 • 62.5 • 50.0 • 50.0	• 160 • 200 • 400 • 500	• 722 ft (220m) • 902 ft (275m) • 1640 ft (500m) • 1804 ft (550m)
Cisco 1000BASE-LX	1300	• MMF • SMF	• 62.5 • 50.0 • 50.0 • 9/10	• 500 • 400 • 500	• 1804 ft (550m) • 1804 ft (550m) • 1804 ft (550m) • 32,810 ft (10 km)
Cisco 1000BASE-ZX	1550	SMF	9/10	–	44–62 miles (70–100 km)

Table 8. Gigabit Ethernet Link Distance

Fiber Core	62.5um MMF	50um MMF	9/10um SMF
Fiber Modal Bandwidth	160/500 MHz-km 200/500 MHz-km	400/400 MHz-km 500/500 MHz-km	–
1000BASE-SX	220m 275m	500m 550m	–
1000BASE-LX/LH	550m 550m	550m 550m	10 km
1000BASE-ZX	–	–	70 to 100 km
Coarse Wavelength-Division Multiplexing (CWDM)	–	–	100 km

Product Specification

Table 9 lists product specifications.

Table 9. Product Specifications

Feature	Description

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Feature	Description
Standards	• Gigabit Ethernet: IEEE 802.3z, IEEE 802.3x, IEEE 802.3ab • 1000BASE-X (GBIC), 1000BASE-SX, 1000BASE-LX/LH, 1000BASE-ZX, CWDM
EtherChannel Technology	• Gigabit EtherChannel: All 1000 Mbps ports • 10 Gigabit EtherChannel: All 10Gbps ports • IEEE 802.3ad (Link Aggregation Control Protocol): All 1000 Mbps ports • Port Aggregation Protocol (PagP): Yes • Number of ports per tuple: 8 • EtherChannel and IEEE 802.3ad technology across line cards: Yes
Physical Dimensions	• Occupies one slot in the Cisco Catalyst 4500 Series platform • Dimensions (H x W x D): 1.2 x 14.25 x 10.75 in. (3.0 x 36.2 x 27.3 cm)
Environmental Conditions	• Operating temperature: 32°to 104℉ (0°to 40℃) • Storage temperature: –40°to 167℉ (–40°to 75℃) • Relative humidity: 10 to 90%, noncondensing • Operating altitude: –60 to 4000m
Safety Conditions	Fiber optic lasers: Class 1 laser products
Safety Certifications	• UL 1950 • EN 60950 • CSA-C22.2 no 950 • IEC 950
Electromagnetic Emissions Certifications	• FCC 15J Class A • VCCI Class A • CE Marking • EN 55022 Class A • EN 55024 Class A • CISPR 22 Class A • AS/NZ 3548 • NEBS Level 3 (GR-1089-CORE, GR-63-CORE) • ETSI ETS-300386-2

Ordering Information

To place an order, visit the Cisco Ordering homepage. Table 10 gives ordering information.

Table 10. Ordering Information

Part Number (“=” indicates “spare”)	Product Name
WS-X4624-SFP-E (=)	Catalyst 4500 E-Series 24-Port GE (SFP)
WS-X4648-RJ45V-E (=)	Cisco Catalyst 4500 E-Series 48-port 802.3af PoE 10/100/1000 (RJ-45)
WS-X4648-RJ45V+E (=)	Cisco Catalyst 4500 E-Series 48-Port 802.3af PoE and PoEP-ready 10/100/1000 (RJ-45)
WS-X4606-X2-E (=)	Cisco Catalyst 4500 E-Series 6-port 10 Gigabit Ethernet (X2)
WS-X4524-GB-RJ45V(=)	Cisco Catalyst 4500 PoE IEEE 802.3af 10/100/1000, 24 ports (RJ-45)
WS-X4548-GB-RJ45V(=)	Cisco Catalyst 4500 PoE IEEE 802.3af 10/100/1000, 48 ports (RJ-45)
WS-X4548-RJ45V+(=)	Cisco Catalyst 4500 PoE IEEE 802.3af and PoEP-ready 10/100/1000, 48 ports (RJ-45)
WS-X4424-GB-RJ45(=)	Cisco Catalyst 4500 24-port 10/100/1000 Module (RJ-45)
WS-X4448-GB-RJ45(=)	Cisco Catalyst 4500 48-port 10/100/1000 Module (RJ-45)
WS-X4548-GB-RJ45(=)	Cisco Catalyst 4500 Enhanced 48-port 10/100/1000 Module (RJ-45)
WS-X4506-GB-T(=)	Cisco Catalyst 4500 6-port 10/100/1000 RJ-45 PoE IEEE 802.3af and 1000BASE-X (SFP)
WS-X4302-GB(=)	Cisco Catalyst 4500 Gigabit Ethernet Module, 2 ports (GBIC)
WS-X4306-GB(=)	Cisco Catalyst 4500 Gigabit Ethernet Module, 6 ports (GBIC)
WS-X4418-GB(=)	Cisco Catalyst 4500 Gigabit Ethernet Module, server switching 18 ports (GBIC)
WS-X4448-GB-SFP(=)	Cisco Catalyst 4500 Gigabit Ethernet Module, 48-port 1000X (SFP)
WS-X4248-FE-SFP (=)	Cisco Catalyst 4500 Fast Ethernet Switching Module, 48-port 100BASE-X (SFP)

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Part Number ("=" indicates "spare")	Product Name
WS-X4124-FX-MT(=)	Cisco Catalyst 4500 Fast Ethernet Switching Module, 24-port 100BASE-FX (MT-RJ)
WS-X4148-FX-MT(=)	Cisco Catalyst 4500 Fast Ethernet Switching Module, 48-port 100BASE-FX MMF
WS-X4148-FE-BD-LC(=)	Cisco Catalyst 4500 Series 48-port 100BASE-BX10-D Fast Ethernet Line Card for single strand of SMF
WS-X4124-RJ45(=)	Cisco Catalyst 4500 10/100 Module, 24 ports (RJ-45)
WS-X4148-RJ(=)	Cisco Catalyst 4500 10/100 Module, 48 ports (RJ-45)
WS-X4148-RJ21(=)	Cisco Catalyst 4500 10/100 Module, 48-port telco (4 x RJ-21)
WS-X4248-RJ21V(=)	Cisco Catalyst 4500 PoE IEEE 802.3af 10/100, 48 ports (RJ-21)
WS-X4224-RJ45V(=)	Cisco Catalyst 4500 PoE IEEE 802.3af 10/100, 24 ports (RJ-45)
WS-X4248-RJ45V(=)	Cisco Catalyst 4500 PoE IEEE 802.3af 10/100, 48 ports (RJ-45)

Warranty

Cisco Catalyst 4500 E-Series and Catalyst 4500 switches are covered by the Cisco Limited Lifetime Hardware Warranty. For more information, see this document on Cisco.com: http://www.cisco.com/en/US/docs/general/warranty/English/LH2DEN__.html

If you purchased a Cisco Catalyst 4500 Series Line Card before May 1, 2009, it is covered by the Cisco 90-Day Limited Hardware Warranty. For more information, see this document on Cisco.com: http://www.cisco.com/en/US/docs/general/warranty/English/901DEN__.html

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For More Information

For more information about the Cisco Catalyst 4500 Series line cards, visit http://www.cisco.com/en/US/products/hw/switches/ps4324/index.html or contact your local account representative.

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